SITE:
BREAK: 6.4
OTHER: vol. 21

USEPA WORK ASSIGNMENT NO. 198-4N19
UNDER
USEPA CONTRACT NO. 68-01-7250

EBASCO SERVICES INCORPORATED

10092185

REMEDIAL DESIGN
FOR
THE TOWER CHEMICAL COMPANY SITE
LAKE COUNTY, FLORIDA

Final Design Report

EBASCO ENVIRONMENTAL
A Division of EBASCO SERVICES INCORPORATED

EBASCO

145 Technology Park, Norcross, GA 30092-2979, (404) 662-2300, Fax (404) 662-2408

August 6, 1990
RMIV-REM-90-0166
Reply Requested: N/A

Ms. Natalie Ellington
U.S. Environmental Protection Agency
Region IV
345 Courtland Street
Atlanta, Georgia 30365

Subject: REM III PROGRAM - EPA CONTRACT NO. 68-01-7250
W.A. NO. 198-4N19; TOWER CHEMICAL COMPANY
FINAL REMEDIAL DESIGN SUBMITTAL

Dear Ms. Ellington:

Ebasco is pleased to submit to you the Final Remedial Design for Tower Chemical.

The cost estimate for Remedial Action is enclosed under separate cover. Please note that this cost estimate is based on worst case conditions. The engineer's estimate that will be used as the basis for comparison to bids will be somewhat less, reflecting reasonable (most likely) costs.

Please contact Site Manager Victor Owens at (404) 662-2316 or myself at (404) 662-2437.

Very truly yours,

D. Karen Knight, CHMM
Regional Manager
Region IV

DKK:VO:mlf

Enclosure

cc: R. Fellmen
B. Houston
D. Knapp
K. Meyer
S. Missailidis
A. O'Rear
V. Owens
F. Tsang
File

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Final Design Report

Prepared by:	Approved by:
Victor H. Owens	Albert D. O'Rear, Sr., PE
Site Manager	Design Manager
Ebasco Services, Inc.	Ebasco Services, Inc.

GEORGIA
REGISTERED
No. 7082
PROFESSIONAL
Expires 12-31-90
ENGINEER
ALBERT D. O'REAR

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 EXECUTIVE SUMMARY

The Tower Chemical Company Site is an abandoned pesticide manufacturing facility located near Clermont, Florida. From 1957 to 1981, manufacture of pesticides resulted in disposal of residues that contaminated soil and groundwater with various contaminants including DDT, dicofol, xylenes, chromium, nickel and lead. Site investigations conducted by EPA and FDER resulted in the site being included in the National Priority List in 1981. In 1983 an Immediate Removal Measure (IRM) was conducted that consisted of contaminated soil excavation, buried drum removal and pond water treatment. By 1987, the Remedial Investigation and Feasibility Study (RI/FS) were completed by NUS Corporation, and the Record of Decision (ROD) was signed July, 1987. The ROD specified excavation and incineration of contaminated soils, with pump and treatment of contaminated shallow groundwater. Ebasco Services Incorporated (Ebasco) was tasked by EPA in January, 1988, to prepare a Remedial Design for contaminated groundwater. In May, 1990, the design was expanded to include all site remediation tasks.

This completed design and contract package consists of performance specifications, detailed specifications, site data, drawings and schedule requirements to obtain and conduct Remedial Action services at the Tower Chemical Company Site. A subcontract for excavation and thermal treatment of soils, and a separate subcontract for site work with groundwater extraction and treatment will be awarded and managed by a construction manager, who is under direction of the USEDA Contracting Officer. A general overview of the responsibilities of the two Contractors is provided in the following:

THERMAL TREATMENT SYSTEM (TTS) SUBCONTRACT

The TTS subcontract includes incinerator setup, trial burn, soil incineration, treated soil verification testing, maintenance of soil stockpile, contaminated soil excavation, treated soil backfill and TTS Site preparation including construction and operation of a retention pond, and all necessary provisions in support thereof. Approximately 9000 cubic yards of contaminated soil in six different areas of the site require excavation and incineration. An area of the site has been designated as the TTS work area and is to be used according to the needs of the Contractor. The TTS Contractor will be responsible for all thermal treatment of waste, maintaining and minimizing the contaminated work area, providing security for the immediate TTS area, providing power and utilities as needed, pretreating process, excavation or decon water for on-site treatment by others, and setting up and maintaining decon facilities for TTS operations, equipment and personnel. As part of site operations, the TTS Contractor will manage water disposal in the retention pond. Water from excavations, decon and processing of soils may be directed to the pond provided pretreatment requirements are met and pond capacity/water treatment capacity are not exceeded. The TTS Contractor will provide all hardware and controls necessary to convey the water to the WTS from the retention pond.

Incineration

It is expected to take 21 months to prepare the trial burn plan, obtain EPA approval of the plan, mobilize, set up, shake down and conduct the trial burn prior to starting full production burning. Thermal treatment is expected to take approximately six additional months at 5 tons per hour and 25% down-time. It is possible that TTS operations will be completed early if greater incinerator capacity or less down-time is achieved.

The TTS Contractor will be required to collect and analyze soil samples to verify contaminated soil excavation completion. The

Contracting Officer will obtain intermittent companion samples for CLP analysis. Contaminated area operations, such as excavation or sampling, that may produce contaminated wastewater will not commence until the Water Treatment System is operational. Work covered by the TTS contract will be conducted in two phases. Phase One includes excavation and treatment of soils from excavations near the building, and soils excavated during preparation of the TTS area. Phase Two includes all remaining soil treatment and demobilization.

WATER TREATMENT SYSTEM (WTS) SUBCONTRACT

A plume of contaminated groundwater extending across the site and covering approximately 10 acres will be extracted using 22 wells, treated, and a portion discharged to a nearby stream while some treated water is reinjected. The Water Treatment System (WTS) Contractor is responsible for providing roads, site grading, site drainage, decon facilities for their equipment and personnel, installation of wells, piping hardware and controls for groundwater extraction and injection, management and operation of a water treatment system and a building to house the system. All utilities, offices and other support necessary to the WTS subcontract scope are the responsibility of the WTS Contractor. The WTS Contractor shall be responsible for procuring and managing site perimeter security. The WTS Contractor will initially install the building and water treatment system without entering or crossing contaminated areas. Upon completion and shakedown of the treatment system, the contaminated soil excavation will commence by the TTS Contractor. The WTS Contractor will commence installation of the Phase One groundwater extraction system, including roads, piping and other hardware, once the WTS is operational. The groundwater extraction system will be installed in two phases. Phase One consists of installation of wells, piping, controls and other hardware outside of the contaminated soil excavation area. Upon completion of soil treatment and backfilling, Phase Two of groundwater extraction system installation will be completed followed by one year operation by the WTS Contractor.

2.0 BACKGROUND AND SITE HISTORY

2.1 Site Description and History

The Tower Chemical Company (Tower) NPL Site is located on County Road 455 along the eastern edge of Lake County, Florida. The site is 3.8 miles east of Clermont, Florida and 1.5 miles west of Orlando, Florida. The Tower Site is an abandoned facility which manufactured various pesticides from 1957 to 1981. See drawing 4236.734-001-C, Site Location Map and Index of Drawings.

The Tower Chemical Company owned and used two separate parcels of land during the time the company was in operation: a main facility site and a spray irrigation field. The irrigation field was cleaned up in 1983, and therefore this design addresses only the main facility site.

The main facility consists of a production building, a small utility building, an office, and two disposal areas: a burn/burial area for solid wastes and a percolation/evaporation pond for acidic wastewaters. The site is relatively flat with only about five feet of relief. Surface water drains into lower areas which eventually drain into an unnamed stream north of the site, which in turn flows into the Gourd Neck area of Lake Apopka. The lake and nearby swamps and wetlands provide an important natural habitat for local wildlife, including nesting bald eagles. See drawing 4236.734-002-C, Existing Site Conditions.

Locally there is no central water supply; thus, approximately 16 local households (60 consumers at the time of completion of the RI) rely on private wells which tap the Floridan Aquifer for their water supply. Within the site area, no surface water resources are used for drinking water supplies, but Lake Apopka is used for recreational purposes.

trade name "Cop-o-cide". In order to produce chlorobenzilate it was necessary to either buy or manufacture the compound dichlorobenzil. During periods in which dichlorobenzil was difficult to obtain, the Tower Chemical Company manufactured it in-house from dichloro-diphenyl-trichloroethane (DDT). This operation was used during the last few months of the Company's operation.

Acidic wastewaters were produced during the manufacturing process. Originally, these wastewaters were discharged into the unlined percolation/evaporation pond located at the main facility. In July 1980, the spray irrigation field was operational and was being used for discharge of the acidic wastewaters. The spray irrigation field was used because the percolation/evaporation pond was full, and in fact did overflow its banks during July 1980.

The burn/burial area had historically been used as a burning ground for disposal of the company's solid chemical wastes and for burial of solid wastes. The buried wastes were both drummed and undrummed wastes.

As a result of the percolation/evaporation pond overflow, the Florida Department of Environmental Regulation (FDER) and the EPA initiated site investigations in August 1980. In December 1980 all production operations were stopped at the Tower Chemical Company and the facility was decommissioned during 1981.

2.2 Permit and Regulatory History

The permit and regulatory history began in July 1979, when the Tower Chemical Company applied for a National Pollutant Discharge Elimination System (NPDES) permit, followed in November 1979 by an application to construct an industrial wastewater treatment and disposal system. These applications referred to occasional discharges of wastewater into the unnamed stream at times of flooding and to the construction of the spray irrigation field. The EPA did not issue the NPDES permit, but the FDER did grant a Permit to Construct for the spray irrigation system.

On June 5, 1980, FDER ordered Tower Chemical Company to cease all discharges from the site. As a result of the damages caused by the wastewater pond overflow, the Tower Chemical Company responded to the order and assured FDER of compliance. In July 1980, the State Circuit Court ruled that the Tower Chemical Company could continue to operate only if the company met the FDER requirements. From this point, Tower Chemical Company and FDER entered into negotiations to define the cleanup process for the site. Meanwhile, FDER pursued legal action against the Tower Chemical Company and its president, Mr. Ralph Roane.

In August 1980, EPA conducted a preliminary Hazardous Waste Site investigation of the Tower Chemical Company Site. The site received a Hazard Ranking System (HRS) score of 44.03. As a result of the HRS score, the Tower Chemical Company Site was proposed for inclusion on the National Priorities List of Hazardous Waste Sites (NPL) in October 1981. The site was finalized on the NPL in December 1982.

In March 1984, EPA tasked NUS Corporation, under the REM-FIT Contract, to conduct a Remedial Investigation and Feasibility Study (RI/FS) for this site.

A public meeting was held on September 16, 1986, to present the draft Remedial Investigation Report and the draft Feasibility Study. The public meeting was the initiation of a public comment period which closed on October 7, 1986. Each comment received during the public comment period was addressed in the Responsiveness Summary.

2.3 Previous Studies

As a result of the 1980 wastewater pond overflow incident, both EPA and FDER initiated separate studies of the Tower Site. The FDER found that water with a low pH extended from the overflow area to Lake Apopka. In August 1980, the Florida Game and Fresh Water Fish Commission conducted a study of the unnamed stream and Lake Apopka. Their results indicated that the fish population in the stream was below normal.

On August 12, 1980, EPA Region IV Environmental Services Division (ESD) conducted a site sampling investigation which included the main facility disposal areas, the unnamed stream, four private wells, and the spray irrigation field. High concentrations of DDT and associated pesticide compounds were found in samples collected from the main facility waste disposal areas. The stream was determined to have been affected by chemicals from the Tower Site.

In 1981, FDER collected samples from the spray irrigation field and the main facility disposal areas. The soils at the spray irrigation field were found to be contaminated by pesticides primarily within the upper foot of soil. Higher levels of pesticide contamination were identified at the burn/burial area and at greater depths. A geophysical survey was also performed at the main facility as part of the FDER study. The report issued by FDER indicated a possible groundwater contamination problem and also noted a mounding effect of the groundwater beneath the former wastewater pond. EPA's Contractor, NUS Corporation, recommended further hydrogeological investigation with the concern focusing on a possible hydraulic connection between the surficial and Floridan aquifers.

In 1982, FDER collected several groundwater samples from temporary sandpoint wells set just below the water table at the main facility. These analytical results indicated the presence of DDT and dicofol in the groundwater.

In December, 1986, a Final Remedial Investigation was completed by NUS Corporation. Results of the study identified areas of the site with high levels of residual pesticide contamination in the soil and groundwater. A Final Feasibility was completed and the Record of Decision signed in July, 1987, which selected thermal treatment of soils and groundwater extraction and treatment.

In 1988, EPA conducted groundwater pumping tests in the Surficial Aquifer to determine the hydrogeologic properties of the site. One pump test was conducted within the backfilled waste pond, and one pump test was conducted within the burn burial area. It was found that the relict sinkhole of unknown dimensions beneath the waste pond required further definition before an adequate groundwater recovery system could be designed.

In 1988 and 1989, EPA collected soil samples and groundwater samples to determine the extent and levels of contamination for purposes of remedial design. Additional wells were installed to determine the edge of the groundwater plume, and additional surveys were conducted to delineate the extent of a relict sinkhole beneath the waste pond. Results from samples collected in February, 1989, are compared to cleanup levels in Section 7.0.

In January, 1990 Ebasco collected groundwater elevation data and performed slug tests on the new monitor wells installed by EPA. Soil samples were collected and analyzed for properties useful in preparing bids for thermal treatment. A laboratory study was completed that simulated the flushing of contaminants from sinkhole sediments. Also, a survey of existing site features was performed to tie the site to the State Plane Coordinate System.

2.4 Previous Site Response Actions

Three Immediate Removal Measures (IRM's) were conducted at the site, following the closure of the Tower Chemical Company. The first IRM was conducted in 1981 at the spray irrigation field, under the lead of FDER. The second and third IRMs were conducted in 1983 and 1988, by EPA, at the main facility site. Descriptions of each IRM follow.

Spray Irrigation Field IRM In 1981, FDER ordered the property owner to clean-up the spray irrigation field. This clean-up was to consist of removal of the contaminated soils around each sprayhead and disassembly of the system. The PVC lines and sprayheads were removed and approximately 1.5 feet of soil was removed from the defoliated areas surrounding each sprayhead. This soil reportedly was placed on the west side of the west pond. The remaining soil was then tilled and limed. Other reports suggest that the spray irrigation field was diced and limed only, and that no soil was removed (Hubbard, 1984). The subsequent RI indicated no significant contamination in the irrigation field area.

Main Facility IRM In 1985, the Centers for Disease Control, Agency for Toxic Substance and Disease Registry (CDC/ATSDR) determined that a potential threat to public health existed at the Tower Site due to the potential for exposure to wastes in the main facility area. Field studies identified a 2,275 square foot area that comprised the burn/burial area. This area was excavated to an average depth of eight feet, where previously elevated levels of pesticides diminished. At a depth of five feet, approximately 70 empty drums and two partially filled drums were unearthed. All of these excavated materials were shipped to the Chemical Waste Management facility in Emelle, Alabama for disposal.

Simultaneous with the excavation activities, water was pumped from the percolation/evaporation pond. The wastewater was treated on-site to levels which complied with existing laws by use of an activated carbon filter and pH adjustment. Once the water level in the percolation/evaporation pond was lowered sufficiently, excavation of the contaminated sediments began. The sediments were dewatered and bulked with the excavated soils before being shipped to Emelle, Alabama.

Solvent Tank Demolition IRM In 1988 EPA demolished two storage tanks near the main facility containing hazardous wastes. Approximately 500 cubic yards of contaminated soil were excavated from beneath the tanks and moved within the fenced area of the site, along with the rubble from the tank foundation demolition.

2.5 Selected Remedy

The declaration for the ROD was signed by the EPA Region IV administrator on July 9, 1987. The selected remedy is excerpted from the ROD document as follows:

- Groundwater recovery operations will be conducted to remove all groundwater which contains contamination in excess of the criteria presented in Section VIII of the Summary of Remedial Alternative Selection. Recovered groundwater will be treated in an on-site treatment facility. Treated groundwater will be stored on-site until analytical results confirm that the effluent meets the established cleanup criteria. Disposal will be via surface water discharge. Groundwater recovery operations will be considered as part of the RA for 10 years from inception or until the groundwater cleanup goals are reached; whichever occurs first. If the groundwater recovery system is still operating after 10 years, the efficiency of the groundwater recovery system will be re-evaluated.

Note: EPA has indicated that on-site storage of treated groundwater will be replaced with a monitoring program similar to but more frequent than typical NPDES permit sampling requirements.

- o Individual treatment units will be provided for the two active wells within the immediate site vicinity: one owned by Mr. and Mrs. Charles Hubbard and one owned by Classic Manufacturing Inc. which provides potable water to the employees of Vita-Green, Inc. EPA will maintain the units until the groundwater recovery is complete.

Note: EPA has indicated that individual well water treatment systems for the Classic Manufacturing Inc. and Mr./Mrs. Hubbard are no longer necessary because the wells will be inactive after RA construction begins. Therefore, storage tank removal and individual residential water supply treatment units are not within the scope of this design.

- o Surface soil removal will be conducted in the overflow area of the former waste water pond, the burn/burial area, around the storage tanks, and all soils which have contaminant concentrations in excess of the clean-up criteria established in Section VIII of the Summary of Remedial Action Selection. This will be approximately 4,000 cubic yards.

Note: Subsequent to the ROD, the contaminated soil quantity has been estimated to be 9,000 cubic yards.

- Point source run-off diversion will divert run-off from the main building roof and the wash down waters for the Vita-Green Company to reduce erosion of the soils. All areas affected by implementation of the selected remedy will be regraded and revegetated to enhance soil stability.

2.6 Design Background

In January, 1988, Ebasco was tasked by Region IV EPA, under the REM IV Contract, to design a groundwater extraction and treatment system for the Tower Chemical Superfund Site in Lake County, Florida. This design was to be based on existing data from the Remedial Investigation. After evaluation of data suitability EPA halted the design effort in August, 1988, in order to install additional wells and conduct pump tests. The design effort restarted in January, 1989, using the additional data. At that time, EPA also increased the design work scope to include preparation of specifications and drawings to obtain contaminated soil treatment services by incineration. Excavation, testing, backfilling and other site work were to be provided by another EPA Contractor and were not part of the design scope. In August, 1989, the work scope was expanded to include a field sampling program to obtain data for soil thermal treatment and leachability of pesticides. In January, 1990, a 60% Remedial Design was submitted by

Ebasco to EPA for review.

In April, 1990, the design workscope was increased to include site work originally to be performed by another EPA Contractor. In May, 1990, the design work scope was increased to include all remediation tasks required, including contaminated soil excavation and backfilling.

3.0 EXISTING SITE DATA

3.1 Design Input Data

Data from the Remedial Investigation and pump test conducted by EPA were used in preparation of this design. Also, portions of data compiled by the EPA Region IV Technical Assistance Team (TAT) were used. These data are excerpted as noted in the appendices of this report. These data sources are referenced below:

- Tower Chemical NPL Site
  Well and Boring Logs
  Site Logs and Entry Exit Logs
  (1989);

- Tower Chemical NPL Site
  1989 Analytical Data
  Data from Soil Borings in Wastewater Lagoon Area,
  Monteverde Landfill Site and Classic Manufacturing
  Drum Compatibilities
  (1989);

- Tower Chemical NPL Site
  1989 Attachments
  Technos GPR Report
  Technos Geophysics Report
  Orlando Laboratories Data
  TAT Interim Report
  CLP Analytical Data
  Media Coverage Relations
  Breedlove Analytical Data

FIT Geophysical Report
(1989);

- Transmittal of Data from Tower Chemical NPL Pump Test
  from Randal Ross, Robert S. Kerr ERL
  to Michael R. Jones, Envirosphere Company
  April 18 and 20, 1988;

- Final Remedial Investigation
  Tower Chemical Company Site
  Lake County, Florida
  EPA TDD No. F4-8611-25
  Contract No. 68-01-7346
  December 1986, Revision 2
  NUS Corporation

- Final Feasibility Study
  Tower Chemical Company Site
  Lake County, Florida
  EPA TDD No. F4-8611-25
  Contract No. 68-01-7346
  July 16, 1987, Revision 0
  NUS Corporation

3.2 Groundwater Sample Data

In early 1989, EPA collected a comprehensive set of samples from existing and newly installed monitor wells across the site. These data are included in Appendix C. Well locations associated with the data are shown in the drawing 4236.734-002-C, Existing Site Conditions.

These data were used by EPA and Ebasco to determine the areal extent of groundwater contamination which is also shown in the design drawings. The indicated plume encompasses every well in which contamination levels exceed groundwater cleanup goals. Plume limits were determined by interpolation between sample points, or from a sample point to a site feature such as the stream.

The plume location in the southwest quadrant, as well as the eastern portion of the site near well MWS-10, were estimated based primarily on the general hydraulic gradient in the Surficial Aquifer combined with nearby well data. Additional monitor wells and groundwater samples would be required to refine the plume boundary in these areas. However, sufficient data are currently available such that the benefits of additional sample collection and analysis are at best marginal. As discussed in the Extraction System Basis of Design, a conservative placement of extraction wells combined with partial reinjection of treated groundwater can be used to compensate for the weaker plume definition in these two areas.

Groundwater sample analytical data were also used to determine major component requirements and sizing of the Water Treatment System. Table 3-1 shows the maximum observed concentration above detection limit of each compound tested.

3.3 Soil Data

Soil excavation requirements were determined by EPA based primarily upon January, 1989 sample data supplemented by Remedial Investigation data. *

Volume of soil to be excavated and incinerated is calculated to be 9000 cubic yards in place (including volume of layback).

TOWER CHEMICAL REMEDIAL DESIGN
TABLE 3.1
OBSERVED GROUNDWATER CONCENTRATIONS AND DISCHARGE CRITERIA

Parameter	Maximum Observed (1) Conc. (ug/1)	Discharge Criteria (2) Conc. (ug/l)	Source (See Footnotes)
Arsenic	10	50	FAC 17-3.061
Barium	190	1000	MCL
Cadmium	5	0.7	AWQC
Chromium	710	11	FAC 17-3.061
Copper	170	6.5	AWQC
Iron	9300	300	(4)
Lead	51	1.3	AWQC
Manganese	750	50	(4)
Nickel	420	88	AWQC
Sodium	270,000	160,000	FPDWS
Zinc	63,000	30	FAC 17-3.121
Cyanide	0.02	5	FAC 17-3.121
Benzene	8	1	(3)
Chlorobenzilate	9	100	(4)
Ethylbenzene	420	453	AWQC
Toluene	14	175	AWQC
Trichloroethene	6	5	(4)
Xylene	1,700	400	(4)
Phenol	37	256	AWQC
Dicofol	1,400	0.08	(4)
DDT	BDL	0.1	(4)
DDE	BDL	0.1	(4)
DDD	BDL	0.1	(4)

Footnotes:
(1) Maximum Observed Concentration is the single highest value occurring any monitoring well based on comprehensive 1989 ground water sampling and analysis conducted by EPA.
(2) Discharge criteria were set based on the more restrictive of Ambient Water Quality Criteria,Florida General or Class III Surface Water Criteria or review comment.
(3) EPA comments on 90% Remedial Design Submittal.
(4) Comment No. 2 from EPA comments on 60% Remedial Design Submittal.

Abbreviations:
MCL: Federal Drinking Water Maximum Concentration Level
AWQC: Ambient Water Quality Criteria for protection of aquatic life freshwater chronic
FPDWS: Florida Public Drinking Water Standards
FAC: Florida Administrative Code
BDL: Below Method Detection Limit

Excavated soils are assumed to average approximately 15% moisture and consist of 80% sand with 20% clay. A sixteen percent swell was estimated during excavation bringing the volume to 10440 cubic yards. Density was estimated in order to convert volume to weight at 120 pounds per cubic foot in place and 103 pounds per cubic foot excavated, both at 15% moisture. The resulting estimated weight was calculated to be 14600 tons of material to be incinerated. Calculations of volume and mass estimates are included in Appendix D. Areas requiring excavation are shown in drawing 4236.734-015-C, Contaminated Soil Excavation Plan.

3.4 Hydrogeology

The Tower Chemical Site is located in the Central Highlands Physiographic province which is characterized by discontinuous,subparallel ridges separated by broad valleys roughly perpendicular to the Atlantic coastline. These valleys and ridges are the result of ancient sea level stands in central Florida.

The site itself is located in a topographically low area, possibly the result of Karst Terrain related subsidence. Topographic elevations surrounding the site reach up to 50' above regional elevations.

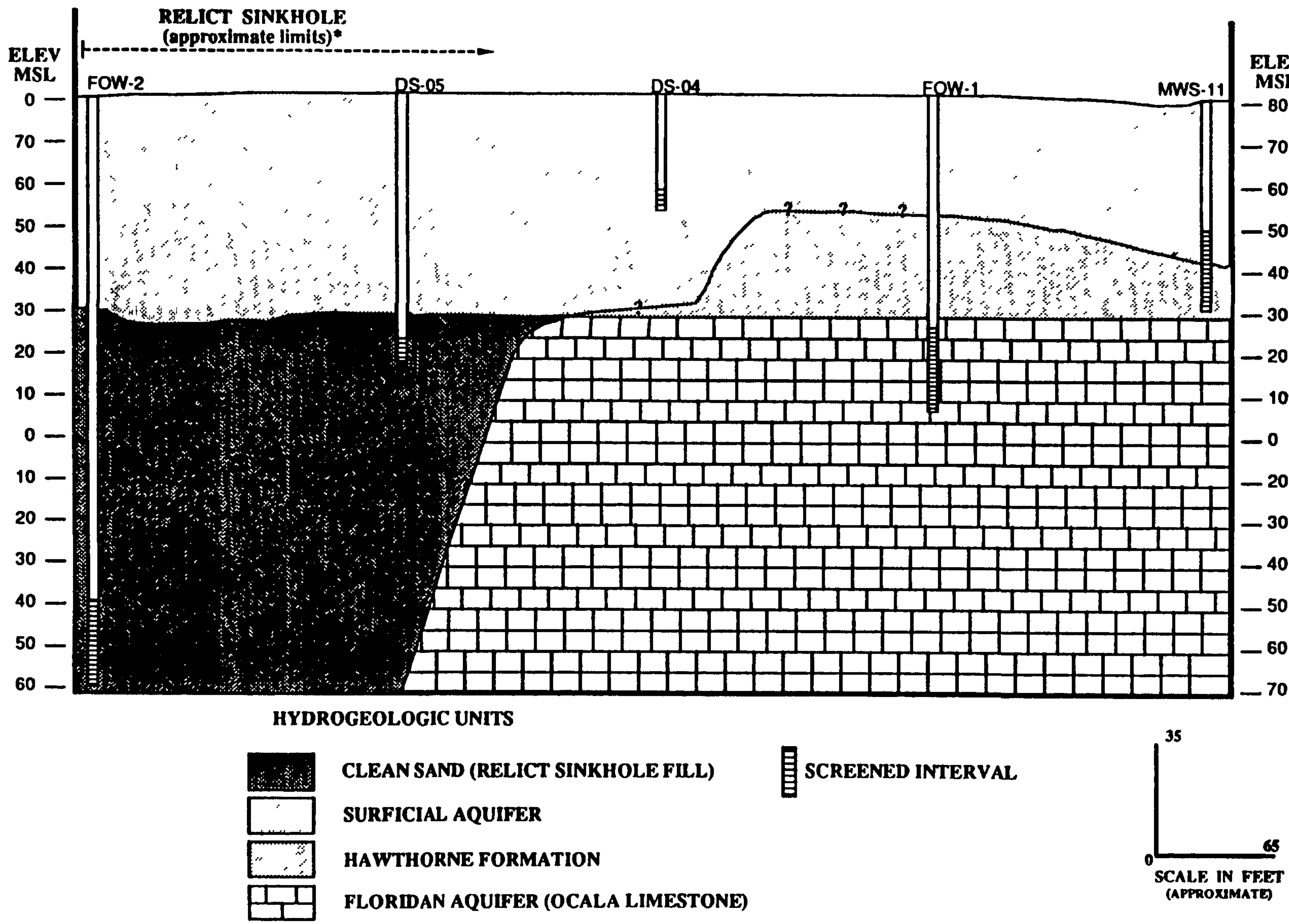
Data from monitor well installations in January 1989 were combined with existing geophysical logs and geological logs from the RI, and were used to evaluate the hydrogeology of the Tower Chemical Site. Based on these data, the stratigraphy at the site essentially consists of three hydrogeologic units, comprised of the undifferentiated surficial clastics, the more silty sandy beds and discontinuous clay of the Hawthorne formation, and the Ocala

Limestone. The Surficial Aquifer and the Ocala Limestone units are separated by the yellowish-green clay of the Hawthorne. A Generalized Geologic Cross Section of the site is shown in Figure 3-1, and a generalized stratigraphic Column is shown in Figure 3-2.

A dominating hydrogeologic feature at the site is a relict sinkhole located in the former wastepond area. The approximate boundary of the sinkhole was determined using well logs and soil borings. Subsequently, geophysical survey data obtained by EPA to more closely define the sinkhole boundary became available. These geophysical data were then used (without reinterpretation) as a qualitative means to check the sinkhole boundary determined from the logs and borings. Comparison of the independent sinkhole boundary determinations agree fairly well, and the approximate boundary is shown on Figure BOD-2 in the Basis of Design for Groundwater Extraction System.

This relict sinkhole is typical of the paleokarst region in central Florida. The sinkhole is completely filled with a very clean quartz to carbonate sand, and 2-3 foot layer of peat occurs at about 120' below surface, near the floor of the sinkhole. The clean quartz and carbonate sand in the sinkhole blends with the surficial sands almost imperceptibly, essentially making the sediments in the sinkhole part of the Surficial Aquifer unit.

The Surficial Aquifer is the focus of the remedial activities * and where contaminated groundwater was detected. Subsurface conditions in the Surficial Aquifer are highly variable, with adjacent borings indicating varying thicknesses of apparently non-continuous lower permeability zones of increased clay



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GENERALIZED HYDROGEOLOGIC CROSS SECTION
TOWER CHEMICAL SITE
LAKE COUNTY, FLORIDA

FIGURE 3.1

* NOT ALL OF RELICT SINKHOLE EXTENT SHOWN ON CROSS SECTION

GENERALIZED STRATIGRAPHIC COLUMN
TOWER CHEMICAL SITE
FLORIDA

(MODIFIED AFTER NUS FINAL RI/FS REPORT 1983)

SYSTEM	FORMATION	THICKNESS	LITHOLOGY
LATE AND POST MIOCENE	UNDIFERENTIATED SURFICIAL CLASTICS	7 - 480 Ft.	SAND AND CLAYEY SAND WITH DISCONTINOUS LENSES OF CLAY
MIOCENE	HAWTHORNE FORMATION	6 - 160 Ft.	UPPER: CLAY WITH SANDY CLAY, LOCALLY PHOSPHATIC LOWER: INTERBEDDED CLAY LIMESTONE, DOLOMITE OR DOLOMITIC LIMESTONE, GRAY PHOSPHATIC
EOCENE	OCALA LIMESTONE	30 - 120 Ft.	LIMESTONE, RELATIVELY PURE, WHITE TO LIGHT BROWN. JOINTING AND FRACTURING MAYBE PRESENT

EBASCO EBASCO SERVICES INCORPORATED	GENERALIZED STRATIGRAPHIC COLUMN TOWER CHEMICAL SITE LAKE COUNTY, FLORIDA	FIGURE 3.2

content. The saturated thickness of the Surficial Aquifer ranges from 35' to 40'. Depth to groundwater from surface is approximately 1 to 4 feet across the site.

Deep groundwater at the site is found in the Ocala Limestone, which is the top most unit of the Floridan Aquifer System, a thick carbonate sequence which includes all or part of the Paleocene to Early Miocene formation series and functions as a water yielding hydraulic unit. The Floridan is a large, jointed and solution channeled, highly transmissive aquifer and provides the major source of potable water for local residents and most of Lake County.

Due to confined aquifer conditions, hydrostatic heads in the Floridan fluctuate seasonally and can be, at times, greater than the Surficial Aquifer heads. For example, one deep well, tapping the Floridan near the site (the Hubbard's residence) has a intermittent hydrostatic head several feet above ground surface.

A dense clay bed acting as a confining unit (Hawthorne Clay) separates the Floridan and Surficial Aquifer. At the site, the clay bed ranges in thickness from a few feet to up to 30 feet. The relict sinkhole sediments, however, provide a hydraulic connection between the Floridan Aquifer and the Surficial Aquifer. Depending on the hydrostatic level in the Floridan, recharge from the Floridan to the Surficial Aquifer can occur. Contamination detected in the well FOW-2, a deep well completed in the sinkhole sediments, suggests that recharge from the Surficial Aquifer to the sinkhole sediments has occurred. However, sampling of wells screened in the upper portion of the Floridan Aquifer in February 1989 did not detect contamination levels above required cleanup levels.

3.4.1 Aquifer Tests

Three aquifer pump tests were conducted at the Tower Chemical Site during March 1988, by the EPA's Robert S. Kerr Laboratory under supervision of EPA Region IV staff. These tests were conducted in two different locations within the site to obtain permeability and storage data for design.

One test was conducted in the relict sinkhole in well PW-2. Observation of drawdown was taken in wells SOW-8, SOW-7, SOW-6, SOW-5 and FOW-2. Well locations are shown in the Basis of Design figures and the raw data from the test is included in Appendix G. The other pump tests were conducted in well PW-1 and were intended to measure aquifer responses to pumping outside the sinkhole in the vicinity of the burn/burial area. Two tests were conducted in this well. The first test used a pump rate of approximately 4 gpm, which lowered the water levels below the pump intakes after a few hours. The second test was conducted at a withdrawal rate of approximately one gpm for 24 hours.

For purposes of remedial design, the pump tests conducted in well PW-1 did not provide the information necessary to characterize the Surficial Aquifer in terms of average expected site permeability or storage. The basis of this statement are well logs revealing that PW-1 was screened almost entirely within one of the interbedded clay lenses prevalent across the site. The low yield of PW-1 combined with the well log of PW-1 indicates that, by chance, the particular location of the well is probably not indicative of the average hydraulic character of the Surficial Aquifer. A comparison of natural gamma logs between the sinkhole and areas outside the sinkhole suggest that the Surficial Aquifer has a lower hydraulic conductivity than the sinkhole, but also has interbedded sands capable of transmitting water at rates much higher than the tests in PW-1 would indicate.

To obtain additional aquifer characterization outside the sinkhole area, monitoring wells MW-8,9,10,11 and MW-12 were slug-tested in January, 1990. The analyzed data resulted in hydraulic conductivities ranging from 2 ft/day to 38 ft/day. An average value of 10 ft/day was used in the basis of design modeling calculations.

3.5 THERMAL TREATMENT DATA

Soil samples were collected at various depths from each of the areas requiring excavation and thermal treatment. Each soil sample was analyzed for the parameters listed in Table 3-2. These data are summarized in Appendix B.

3.6 Standard Penetration Test Data

A total of 4 shallow soil borings for Standard Penetration Test (SPT) were conducted in the TTS operation area and in the WTS facility area, to obtain soil stability data. These data are shown in Appendix F. It may be necessary for additional SPT data to be obtained by the Contractors in the exact locations of the major site remediation equipment. These data may be required only for some RA equipment configurations which are vendor specific. Therefore, vendors will be required to perform geotechnical testing only as needed for their specific equipment, and bids will include these costs.

3.7 Stream Survey

In 1989, EPA and Ebasco conducted a survey of the unnamed stream starting from the Tower Chemical Site and ending at Lake Apopka. The purpose of the survey was to determine the potential impact to downstream areas due to discharge from the Water Treatment System. The conclusion of the survey is that a 250 gpm discharge to the stream would have negligible impact to areas downstream. The supporting data and calculations performed to reach this conclusion are contained in Appendix D.

Table 3-2

Contaminated Soil Parameters Provided for TTS Design

Tower Chemical Remedial Design

PARAMETER	TEST METHOD
Percent C, H, S, N and O	ASTM D-3176
Percent Fluoride	ASTM D-3761
Percent Cl,	ASTM D-4208
Gross Calorific Value	ASTM D-2015
pH	SW 846-9045
Proximate Analysis (% Moisture, Volatile, Ash)	ASTM D-3172
Particle Size Analysis	ASTM D-422
Elemental Analysis in Ash	ASTM D-2795
Trace Metals Analysis in Ash	ASTM D-3683
Specific heat	ASTM D2766

4.0 REMEDIAL DESIGN CRITERIA

4.1 Groundwater Cleanup Criteria

The criteria to which the groundwater must be remediated are identified in the ROD as Target Cleanup Levels (TCLs). If the contamination levels in the shallow aquifer exceed the TCLs, the groundwater must be extracted and treated. Groundwater remediation will be complete when it can be demonstrated that contamination levels in the shallow aquifer are below the TCLs. The TCLs are shown on Table 4-1.

4.2 Surface Water Discharge Criteria

A second groundwater cleanup criteria applies when the treated groundwater is discharged to surface water or reinjected to accelerate plume cleanup. A portion of the treated effluent from the Water Treatment System will be discharged to the surface water and the remainder reinjected back into the aquifer. These discharge standards are shown in Table 3.1.

4.3 Groundwater Extraction System

The criteria for preparing the conceptual groundwater extraction system consist of the following general requirements:

- o The contaminated groundwater plume as shown in the drawings is to be intercepted or collected such that off-site migration is halted and contaminated groundwater is removed for treatment.

Table 4.1
TARGET GROUNDWATER CLEANUP LEVELS
TOWER CHEMICAL REMEDIAL DESIGN

Indicator Contaminant	Target Cleanup Level (ug/L)	Source
Arsenic	50	FAC
Nickel	350	HA
Chromium	50	FAC
Alpha-BHC	0.05	MDL
Chloroform	5	MDL
DDT(1)	0.10	EPA(2)
Chlorobenzilate	10.0	EPA(1)
Dicofol	0.08	EPA(2)
Xylene	400	EPA(2)

(1): Sum concentration of DDT, DDE, DDD

FAC: Florida Administrative Code 17-3.061

HA: Office of Drinking Water Health Advisory

MDL: Minimum detection limit established for the Contract Laboratory Program (CLP); provided for Compounds which have 10^{-6} health based criteria below detection levels.

ACL: Alternate Concentration Limit calculated by the Region IV Regional Expert Toxicologist; based on 10^{-5} to 10^{-6} health risk levels.

CAG: Cancer Assessment Group, EPA (from Record of Decision).

EPA(1): Comment No. 7 from EPA comments on 30% Remedial Design document.

EPA(2): Comment No. 2 from EPA comments on 60% Remedial Design document.

- The system should be flexible, with an approach that allows for uncertainty in the existing aquifer characterization.

- Treated groundwater reinjection should be used to accelerate cleanup and prevent aquifer dewatering. *

- Pumps, controls and other hardware will operate after initial start-up without or continuous on-site Supervision.

4.4 Water Treatment Criteria

The following criteria have been established and utilized for specifying a water treatment system to treat the contaminated groundwater and any wastewater generated from soil remediation activities at the Tower Chemical site:

- The Water Treatment System is to be modular in order to allow the minimum required capacity to treat the actual waste water flow quantities.

- The quality of the untreated influent to the treatment system is based on the maximum observed contamination level of the identified contaminants as shown in Table 3-1.

- The quality of the treated effluent from the system shall be in compliance with the Discharge Criteria as established by EPA and FDER and shown in Table 3-1.

- Sludge generated from the treatment system will be dewatered, tested, and disposed of off-site in an approved landfill. The spent carbon will also be tested and disposed of off-site in an environmentally acceptable manner, which may be an approved landfill or through incineration and ash disposal.

4.5 Soil Cleanup Criteria

Treatment levels for soil were provided by the ROD. Additional contaminant cleanup levels were established by EPA based on health-based risk calculations specific for the site. Table 4-2 summarizes the soil cleanup levels and basis for selection of these levels.

4.6 Thermal Treatment Requirements

The incinerator must be designed and operated to achieve the following criteria:

- Meet applicable emissions standards in the flue gas;
- Reduce pesticide concentrations in ash to below cleanup criteria for soils (Table 4.2);
- Destroy target pesticides in combustion gas with 99.99% efficiency;
- Maintain ambient air quality standards at the site boundaries;
- Remove particulate from flue gas to the greatest extent possible.
- Complete production burn in six months.

4.7 Site/Civil/Layout Criteria

The criteria for design and construction of site civil work are to:

TABLE 4.2
TARGET SOIL CLEANUP LEVELS
TOWER CHEMICAL REMEDIAL DESIGN

Indicator Contaminant	Target Cleanup Level (mg/kg)	Source
Copper	7,500	EPA(1)
Lead	100	ROD
Arsenic	5	ROD
Dicofol	5	EPA(2)
Chlorobenzilate	24	EPA(2)
DDT[(1)]	35	ROD
Xylene	50	EPA(1)

EPA(1): Region IV EPA, Memo from R. Fox to T. Snow, January 31, 1989 and memo from J. Starn to T. Snow, December 22, 1988, and memo from G. Adams to T. Snow, July 7, 1989.

EPA(2): Comment No. 9 and No. 10, Comments from EPA on 30% Remedial Design submittal.

ROD: Record of Decision, July 9, 1987

(1): Sum of DDD, DDT, DDE.

- Optimize site operation efficiency by organizing the layout of roads and structures.

- Collect runoff water from the TTS operations area into a retention pond for treatment and discharge to a nearby creek.

- Utilize the existing site structures and foundations to the extent practical.

- Locate areas of noisy operation (TTS) away from local residences to minimize impact of site operations.

- Route clean surface runoff to the nearby creek.

- Utilize site materials (fill material) as practical to avoid bringing in off-site material.

Additional specific design criteria are shown in Appendix H.

4.8 Mechanical Design Criteria

Design criteria for the Mechanical System consists of the following:

- Flow from individual Recovery Wells is set manually by way of an in-line globe valve and flow indicator at each well group. As level in a well is drawn down from normal ground water level to the operating level, the globe valve will require adjustment to compensate for increasing pump lift. Flow is to be set to minimize water level cycling between the high and low level switch settings.
- Lines were sized to limit friction losses to about

10% of total pump head so that flow from individual wells is not dramatically affected by change in total number of operating well pumps.

- The differential between the high and low level recovery well switch settings should not exceed about 5 feet to minimize the effect of changing well level on pump flow rate.

- Flow enters the Flow Equalization Tanks above the water level so that recovery well output is not affected by level in the Flow Equalization Tanks.

- Recovery Well operating level is not more than 35 feet below ground level.
- Flow Equalization Tank shell height does not exceed 31 feet.

- Flow to each pair of Injection Wells is manually regulated by an in-line globe valve and flow indicator.

- Operation of Recovery Pumps is contingent on appropriate 'free-board' in the Flow Equalization Tanks.

- Should water level in an Injection Well rise to the point of over-flow, a level switch will activate a solenoid valve to block flow into that well.

- Flow to and from the Water Treatment System will vary with operation of the Recovery and Injection Wells. Water inventory control is accomplished within the

Water Treatment System and not by automatic control of well flows.

4.9 Electrical System Design Criteria

In general, the electrical and control system for groundwater extraction and re-injection were prepared in accordance with the National Electrical Code-1990. Specific criteria consists of the following:

- o The System is sized for 800 ampere service main disconnect.
- o Line voltage drops are limited to 3% or less.
- o Maximum well pump horsepower is 0.5 hp, and all service receptacles are maximum 1.5 ampere. The retention pond pump horsepower is 4.2.
- o All field circuits are ground-fault interrupt and continuous grounding for operator safety.
- o All junction boxes will be water-tight and dust-tight (NEMA-32R boxes).
- o Security lighting will be provided at the entrance only.

5.0 DESIGN AND SPECIFICATION CONCEPTS

The ROD requires the remediation of soils using on-site incineration. The TTS Contract Document is based on performance specifications to allow the most economically and technically competitive cleanup. Therefore, the design specifications are a set of siting, schedule, performance and monitoring requirements that allow the full range of incineration technologies currently available.

Groundwater extraction and treatment is required by the ROD. Activated carbon is required in the ROD for the removal of organic contaminants. Chromium, nickel, lead and other metals are groundwater contaminants that must be treated to the 1 to 10 ug/l levels for discharge to a nearby stream and reinjection. A set of performance specifications for installation and operation of a Water Treatment System has been prepared, with some general process requirements included. The Extraction and Injection Well System is specified in some detail, but allows for flexibility to account for variable site conditions.

5.1 Thermal Treatment

The TTS Contract is the means by which contaminated soil will be remediated. Under this contract, a Contractor will prepare a portion of the site for the incinerator, construct the stormwater runoff retention pond, excavate, treat and backfill contaminated soil, and close the retention pond. Specific requirements that form the basis of the contract specifications, as well as some key bid requirements are discussed in the following:

Primary Requirements for the Incinerator

The primary requirement of the incinerator is to remove pesticides and xylene from soil to a level below the cleanup criteria. In addition, the system must be designed and operated to meet emissions requirements in the flue gas from the stack, maintain ambient air quality standards at the site boundaries and achieve a destruction removal efficiency of 99.99% for organic compounds targeted for cleanup by EPA.

Process Description

Wastes from the stockpile will be transferred, weighed, then preprocessed for incineration. Preprocessing may involve size reduction, blending or adding materials to improve fluidization or acid gas removal. Wastes will then be screened for size. The exact size requirements will depend on the limitations of the selected system. Undersize materials will be transferred to the incinerator, or a stockpile from which the incinerator is fed. Oversize will be returned to preprocessing. Oversize metal scraps will be removed for decontamination.

Treated ash from the incinerator and any fly ash will be stockpiled and sampled. Ash which fails to meet the criteria for organics shall be reburned in the incinerator. Ash which unexpectedly exceeds the metals cleanup criteria shall be stockpiled for later stabilization by another contractor. Ash which meets both organics and metals criteria shall be removed and backfilled.

Combustion Air/Oxygen Requirements

Ultimate analyses of several site soil samples are provided to prospective Thermal Treatment Contractors in Appendix B. The Thermal Treatment Contractors must propose overall sufficient air for the process to achieve stoichiometrically complete combustion and a minimum quantity of excess air at some point in the process to ensure contact with oxygen in the combustion chamber(s). Any proposed system using less than stoichiometric ratios of oxygen for the overall combustion process is not reasonable. Any process that does not have at least one combustion stage using 50% or greater excess air will be questioned. Data and/or calculations must be provided demonstrating that complete combustion can be achieved. Bid evaluation and proposal evaluation will include an estimate of stoichiometric oxygen requirements based on ultimate analysis and mass balance calculations.

Air Pollution Control Requirements

Air pollution control requirements are determined by regulation. Some requirements are for stack measurements, others for ambient air quality at the site boundary. The latter are modeled, using site specific features and wind rose data to obtain stack requirements. Table 5.1 lists the requirements.

Chlorides are present in the pesticides. Ultimate analyses, including % chloride in the wastes, are furnished in Appendix B. Due to the low concentrations of pesticides, the concentration of chloride is expected to be low. If, based

Table 5.1
Air Pollution Control Requirements
Tower Chemical Remedial Design

Parameter	Limit	Source
DRE	1) >99.99% at the stack	40 CFR 264.343
HCl	1) 4 lb/hr or 99% retained	40 CFR 264.343
Particulate	1) 0.08 gr/dscf at stack	40 CFR 264.343 & 40 CFR 60.52
	2) 50 ug/m^3 annual arithmetic mean - ambient at boundary	FAC 17-2.300 & 40 CFR 50.6
	3) 150 ug/m^3 24 hour average-ambient at boundary	FAC 172.300 40 CFR 50.6
Carbon Monoxide	1) 1 hour concentration of 35 ppm - at boundary	FAC 17-2.300 & 40 CFR 50.8
	2) 8 hour concentration of 9 ppm - at boundary	FAC 17-2.300 & 40 CFR 50.8
Sulfur Dioxide	1) 3 hour concentration of 0.5 ppm - at boundary	FAC 17-2.300
	2) 24 hour concentration of 0.1 ppm - at boundary **	FAC 17-2.300
	3) Annual arithmetic mean of 0.02 ppm - at boundary**	FAC 17-2.300
Ozone	1) Daily of 0.12 ppm at boundary	FAC 17-2.300 and 40 CFR 50.9
Nitrogen dioxide	1) Annual Arithmetic mean of 0.053 ppm - at boundary	40 CFR 50.11
Lead	1) 1.5 ug/m^3 over calendar quarter - at boundary	40 CFR 50.12

*Notes on Sources:

40 CFR 264.343 is the RCRA Performance Standard for Hazardous Waste Incinerators.

40 CFR 60 is the New Source Performance Standard for Incinerators.

40 CFR 50 is the Primary and Secondary Ambient Air Quality standards

FAC 17-2.300 is the Florida Ambient Air Quality Standards.

** Means other sources regulated this parameter but at less stringent levels.

on the subcontractor's proposed feed rates and chloride concentrations, the possibility exists for more than 4 lb/hr hydrogen chloride formation, the Contractor must include a scrubber system capable of 99% HCl removal from the flue gas. It is expected that the base system will include an acid gas scrubber unless convincing evidence is provided indicating this process step is not required. Particle size distributions are furnished in Appendix B. In the proposal, the Thermal Treatment System Contractor must provide calculations and/or performance data as evidence of estimated particulate carryover to the air pollution control device. Designs which can result in excessive particulate carry-over to the air pollution control devices will be questioned.

The Thermal Treatment System must provide at a minimum an air pollution control device capable of cleaning flue gases to 0.08 gr/dscf as required by RCRA. Based on particle sizes and estimated particulate carryover rates, any proposed design which appears incapable of cleaning the flue gas to 0.08 gr/dscf will be unacceptable. Data and case history information must be provided demonstrating that the system is capable of meeting particulate emissions standards.

The Contractor will be required to demonstrate that all applicable emissions limits are achieved including but not limited to Table 5.1. This is expected to be stack monitoring for applicable limits of carbon monoxide, HCl and Particulate, possibly combined with air emission modeling by others. It is expected that the overall process will operate at less than 100 ppm of carbon monoxide in order to achieve 99.99% DRE on the POHCs and reduce PIC formation.

large wooden privacy fence
Dust Require

may include water
trucks or lime
sample air -
for dust
measure

If the results indicate that air quality standards will be exceeded, the maximum throughput which would result in compliance will be calculated. Provided that this throughput is sufficient to meet the schedule, the Contractor shall have the choice of operating below this maximum or setting up monitoring stations during the Trial Burn to demonstrate compliance at a higher throughput.

During the Trial Burn, emissions shall be monitored for SO_2, particulate, CO and NO_2 in the stack gas. If the Contractor opts not to set up perimeter monitoring stations and emissions exceed predicated values, the model shall be rerun using actual worst case data from the Trial Burn.

Throughput Requirement

Based on completing incineration of 16000 tons of soil in 6 months, the throughput for a 24 hour day, 7 day per week unit would need to be 3.7 ton/hr. Assuming 25% down time, the unit must be capable of incinerating a minimum 5 tons soil/hr.

Heat content and moisture for selected soil analysis are provided in the appendices. Bid evaluation/proposal evaluation will check calculations of required fuel input and waste feed rates using heat and material balances and the thermal rating of the proposed system. Any significant variation in the proposed claims for throughput and evaluation calculations will require justification.

Required Interlocks

Critical process parameters will require automatic monitoring. Excursions from established ranges or exceedence of regulatory requirements will result in the interlock response of stopping the waste feeder. The Contractor will be required to describe these interlocks for the specific Thermal Treatment System such that trial burn conditions are maintained and excessive down-time is avoided. Parameters to be monitored include but are not limited to the following:

- Waste feed rate monitor failure;
- Combustion air monitor failure;
- Combustion pressure monitor failure;
- Combustion temperature monitor failures;
- Flue gas oxygen low;
- Combustion efficiency 99.9% (indicated by CO);
- Combustion outlet temperature low;
- Combustion outlet temperature high;
- FD fan failure;
- ID fan failure;
- Bag house inlet temperature high;
- Gas residence time low;
- Stack particulates;
- Power Failure;
- Positive Pressure in Kiln.

Stack Height Requirement

Stack heights shall meet the requirements of the Florida Air Pollution Control Rule FAC 17-2.270, stack height policy.

The specific requirements will be determined by the TTS Contractor from building heights of nearby structures.

Trial Burn Requirements

A Trial Burn will be required at the site using representative site soil spiked with DDE and DDT. It is expected that the subcontract or will submit a Trial Burn Plan that covers sufficient ranges of operational parameters to provide for reasonably variable feed conditions. This is intended to avoid production rate problems due to feed variability. The Trial Burn must demonstrate, at a minimum, the following:

- o Ability to achieve 99.99% DRE of DDE and DDT;
- o Ability to control particulate emission to below 0.08 gr/dscf;
- o Ability to control HCl emissions to 4 lb/hr or 99% removal efficiency;
- o Ability to remove organics from the soil to the following levels:

Xylene	50 mg/kg
Dicofol	5 mg/kg
Chlorobenzilate	2.4 mg/kg
Sum of DDE, DDT and DDD	0.087 mg/kg

- o Ability to maintain Ambient Air Quality Standards at site boundary.

Ash Treatment Requirements

Ash and baghouse fines shall be stockpiled and tested separately. All ash and baghouse fines must be treated to below the following levels in the Thermal Treatment System.

Xylene	<50 mg/kg
Dicofol	<5 mg/kg
Chlorobenzilate	2.4 mg/kg
Sum of DDT, DDE and DDD	<0.087 mg/kg

Any ash and baghouse fines exceeding these levels shall be reprocessed through the system. If necessary, the fines shall be rewetted to increase residence time. Ash shall also be tested for metals. Any ash exceeding the following levels of metals shall be segregated and stockpiled separately.

Total Copper	7500 mg/kg
Total Lead	100 mg/kg
Total Arsenic	5 mg/kg

Process Water Disposal Requirements

The Contractor shall be required to minimize the production of wastewater from the incinerator and air pollution control and ash handling system. The disposal of any wastewater generated by the Contractor shall be the responsibility of the Contractor. If wastewater meets pretreatment requirements as specified in the Contract it will be treated on-site by others.

Demonstration of Complete Combustion

During the Trial Burn and operation, levels of CO, CO_2 and O_2 will be continuously monitored and recorded. In addition, stack gases shall be continuously monitored for total hydrocarbons.

Hydrogen Chloride

Hydrogen chloride gas emissions will be monitored during the Trial Burn. In the Trial Burn, higher concentrations of pesticides will be incinerated than have been detected on site. It is anticipated that the pesticides will be the major contributor of chlorine (this will be confirmed by % Cl results of ultimate analyses prior to Trial Burn) and the Trial Burn will therefore represent "worst case" chloride concentration. Monitoring will be conducted in the stack gas to assure that the 4 lb/hr or 99% retention required by 40 CFR 264.343 is satisfied.

Particulate and Lead

Particulate emissions will be measured in the stack gas during Trial Burn to assure that the limit of 0.08 gr/dscf required by 40 CFR 264.343 and 40 CFR 60.52 is met. Samples of respirable particulate will be collected at selected locations at the site boundary during the Trial Burn and throughout operation. Samples will be analyzed according to EPA 600/4-77-027a, Section No. 2.11 for respirable particulate. Excursions over the ambient air quality limits for particulate listed in Table 5.1 will result in shutdown of all operations until appropriate levels are maintained.

Occasional particulate samples shall be analyzed for lead to assure that Ambient Air Quality Standards are not exceeded.

Retention Pond

A lined Retention Pond capable of containing all TTS work area storm runoff is needed to ensure that contaminated soil is not spread across the site. The pond will be constructed as described in design drawings and specifications and will be operated by the TTS Contractor. The pond will serve as a collection point for various wastewaters produced during site cleanup with the requirement that process wastewater discharged to the pond must not exceed the following criteria:

Total Suspended Solids	100 mg/L
Chemical Oxygen Demand	50 mg/L
Total Organic Carbon	50 mg/L
pH	6.5-8
Color-Units	20

Any wastewater failing to meet these criteria either as discharge to the pond or as effluent from the pond pumped to the Water Treatment System shall be pre-treated to the required criteria. Dewatering effluent resulting from excavation dewatering must meet the requirement for total suspended solids only. It is the responsibility of the TTS Contractor to avoid overfilling the pond as a result of excess water disposal to the pond. A maximum average discharge rate of 125 gpm from the pond will be allowed. If necessary, additional discharge capacity up to 250 gpm can be provided by increasing water treatment capacity.

Earthwork

The Earthwork that the TTS Contractor will perform includes both clean soil excavation to construct the retention pond, contaminated soil excavation and stockpiling, treated soil backfilling and site grading for TTS operations. Contaminated soil will be removed to limits shown on the excavation plan (Drawing 4236.734-15-C). Verification sampling of the excavation will be performed by the TTS Contractor and any areas exceeding the soil cleanup criteria will require excavation and thermal treatment. It is anticipated that the TTS Contractor will excavate, treat, test and backfill in stages to avoid excessive stockpiling. Therefore, it will be necessary to have a "clean" excavation prepared to receive treated soil before opening new areas of contaminated soil excavation.

Stockpiling

The existing building is in disrepair and in its current state is considered unsafe for use by the Contractor as a stockpiling or operations area. Use of the building will be at the discretion of the Contractor, provided necessary repairs are made to the building. If the TTS Contractor wishes to use the building, then the Contractor will be required to describe the means for making the building suitable for use in his proposal and bid. Otherwise, the Contractor will have the option of utilizing available site area, designated as the "TTS Area," as best meets the specific needs of the Contractor, subject to Contracting Officer approval.

Noise Control

Due to the presence of nearby private residences, it will be necessary to control the level of noise created by the site cleanup operations, particularly the TTS operation. Noise control will be obtained through the use of shrouds, enclosures, buildings or other suitable means and will be monitored by the Contracting Officer.

Noise from the incinerator and ancillary equipment, including mobile equipment such as scrapers, loaders and dozers, shall be controlled to protect the two nearest residences in accordance with the measured values at the residences as shown in Table 5.2.

The two residences of concern are located about 400 feet east and 550 feet northeast of the proposed incinerator site as shown on Ebasco Drawing Number 4236.734-012-C. Large fans are susceptible to producing tonal noise which can be particularly annoying at distant locations. These tones must be controlled to the specified levels shown in the table.

Near-field noise levels of the same equipment shall be controlled to protect on-site personnel noise exposure to OSHA limits without the aid of hearing protectors or administrative controls. The near-field noise levels shall not exceed 85 dBA measured 3 feet from the equipment at five feet above ground and on any elevated catwalk, ladder or other personnel access area.

TABLE 5.2
ALLOWABLE FAR-FIELD NOISE LEVELS AT RESIDENCES
TOWER CHEMICAL REMEDIAL DESIGN

Time Period	Hourly Equivalent Noise Level (dBA)	Maximum Instantaneous Noise Level (dBA)	Maximum Pure Tone Level*
Daytime (7 am.-10 p.m.)	60	70	55
Nighttime (10 p.m.-7 a.m.)	50	60	45

*In any octave band after A-Weighting factor is applied

Treated Soil

Bottom ash and any flue gas fines will be collected and stockpiled separately, each accumulation shall be segregated into daily accumulations. Each accumulation will be sampled and analyzed for the following parameters:

Parameter	Test Method
Dicofol	SW 846-8080 or 8270
Lead	SW-846-7421
Copper	SW 846-7210
Arsenic	SW 846-7060
Chlorobenzilate	SW 846-8080 or 8270
DDT	SW 846-8080 or 8270
DDE	SW 846-8080 or 8270
DDD	SW 846-8080 or 8270
Xylenes	SW 846-8020

5.2 Water Treatment

The WTS will be used to treat all the groundwater extracted from the site, contaminated stormwater runoff from the TTS area, soil stockpile, and ash storage area and excavation area, decontamination water from washing and cleaning of personnel, vehicles and equipment, and other process waters from RA activities that meet influent criteria to the WTS. Detailed design, equipment selection and erection, field installation and operation for the Water Treatment System shall be the ultimate responsibility of the Contractor.

5.2.1 Conceptual Process Selection

The water treatment processes are based on waste characteristics, treatment requirements, process effectiveness and reliability, treatment economics, operation and control constraints and environmental considerations. However, the main emphasis of the process selection is placed on the nature of the contaminants in the groundwater and the degree of treatment required to meet the Surface Water Discharge Criteria.

The results of the Remedial Investigation and more recent field data indicated that the groundwater at the Tower Chemical site is contaminated with various heavy metals, pesticides and xylene. Thus, the treatment processes must be capable of removing various heavy metals and organic contaminants.

Several technologies are available for the removal of heavy metals from waste streams. These technologies include: ion exchange, reverse osmosis, chemical precipitation and electrochemical coprecipitation. The electrochemical process is more desirable than the other processes for the following reasons:

- o The process is very effective for heavy metal removal;
- o No major chemical addition is needed for metal precipitation except for anionic polyelectrolyte being added for flocculation;
- o As long as the pH of the entering streams is in the range of 6 to 9, no pH adjustment is necessary on either the influent or the effluent streams;

- Organics removal subsystem;
- Sludge processing subsystem.

The unit operation of each subsystem is described below:

Waste Equalization and Transfer Subsystem

The contaminated water collected on-site is pumped to two Flow Equalization Tanks. The Flow Equalization Tanks are provided to smooth out the contaminants concentration and flow variation, to minimize the potential upsets and to promote a steady state treatment. The Flow Equalization Tanks also serve as holding tanks for the backwash water from the multimedia filter and the filtrate from the sludge dewatering equipment. One transfer pump, rated at 125 gpm, is included for transferring the water to the treatment units. The operation of the pump is controlled by the level controller in the Flow Equalization Tanks. A flow meter is installed in the pump discharge line to measure the amount of water being treated.

Metals Removal Subsystem

The following components are included in this subsystem:

- Electrochemical cell - One electrochemical cell is included. In the electrochemical cell, a direct current is conducted through the cell containing carbon steel electrodes generating ferrous ions into the waste stream. When hexavalent chrome is present, the ferrous ion acts as a reducing agent, reducing hexavalent chromium to its insoluble trivalent state. Other heavy metals such as arsenic, barium, copper, lead, nickel and zinc are effectively coprecipitated with the ferrous hydroxide as metal hydroxides. If chelating agents are present, the chelated metals are removed along with other heavy metals.

- Retention tank - one retention tank is included to remove the small amount of hydrogen gas formed in the cell during the electrochemical processing.

- Clarifier - One clarifier is included to precipitate metals and suspended solids from the wastewater. The clarifier shall be an inclined plate separator equipped with a flocculation chamber to enhance solids separation. A chemical feed system shall be provided to feed liquid polymer into the waste stream prior to flocculation. The flocculator is included to provide gentle agitation of the water allowing the formation of a bigger floc that is easier to settle in the clarifier. The sludge from the clarifier is pumped to a sludge thickener and then to sludge dewatering equipment for further processing. Treated effluent from the clarifier is pumped to the multimedia filter. The operation of the pumps is controlled by a level controller in the clarifier.

- Multimedia filter - One filter unit is included to remove trace amounts of small particulates. Each filtration unit consists of multimedia filter vessel, filter media, backwash feed tank and backwash water pump. The piping is arranged to allow for either filter to be removed from service for backwashing or maintenance. The treated effluent will flow under pressure to the carbon adsorption units.

Organics Removal Subsystem

Three downflow carbon adsorption units shall be provided.

Two units shall serve as main adsorbers, the third unit will serve as a redundant polishing unit. Each adsorption unit shall consist of process vessel, granular activated carbon, under drain collection system, instrument and piping. The system shall be arranged to operate both in series and in parallel. During operation, the water enters the adsorber at the top and flows downward through the carbon bed. An internal collection system shall be provided to collect the treated water and retain the granular media in the bed. In series configuration, the effluent from the lead adsorber is directed to the second adsorber. The treated water is then discharged through the effluent piping, through the polishing unit, to the surface water or reinjected back into the Surficial Aquifer.

When the carbon in an adsorber becomes saturated with contaminants adsorbed from the water, this adsorber is taken out of service to replace the spent carbon with virgin grade carbon. The flow is directed to the remaining adsorber allowing the treatment system to remain in service. After the adsorber has been changed it is placed on line with the remaining adsorbers.

Spent carbon transfer is accomplished in a closed piping system to minimize environmental exposure. Disposal of spent carbon is off-site and performed in an environmentally acceptable manner.

Sludge Processing Subsystem

Sludge precipitated in the clarifier often contains solids ranging between 1 and 2 percent. A sludge thickener and a mechanical dewatering equipment are included to reduce the sludge volume to facilitate the sludge handling and disposal. A sludge thickener is included to thicken the sludge to at least 5 to 10 percent solids. A dewatering device such as filter press, pressure filter, vacuum filter, etc., is included for further extraction of water from the sludge. A chemical feed system shall be provided to condition the sludge. The chemical feed system pumps polymer solution from the polymer solution tank for the main treatment unit. The dewatering device with proper chemical conditioning is expected to produce a dry cake containing 25 to 35 percent solids. The filtrate is returned to the Flow Equalization Tanks for further treatment. The dewatering device is installed indoors and is mounted on an elevated platform to permit the use of a dumpster as a receptacle for collection of the dry cake. The dry cake shall be tested and disposed of off-site. It is anticipated that the dry cake will not be a characteristic waste and therefore will not encounter land-ban restrictions. However, if necessary, the relatively small volume of dry cake produced over a few months operation can be stockpiled on-site for further treatment.

5.2.3 Design Basis

a. Design Flow Rates

Average - 100 gpm, expandable to 200 gpm.
Maximum - 125 gpm for peak load, expandable to 250 gpm.

b. Flow Equalization Tank

The Flow Equalization Tanks are sized for 8-hour storage based on the maximum design flow rate plus additional capacity for storing backwash water from filters, supernatant from a sludge thickener and filtrate from the dewatering equipment. Two closed top Flow Equalization Tanks are included.

c. Wastewater Transfer Pumps and Control

One pump is included to transfer the water to the treatment units. The pump is sized for 125 gpm at 80 feet total dynamic head. The pump is driven by a high efficiency electric motor. The electric motor shall be 240 volt, 3 phase, 60 Hertz.

d. Chemical Feed Systems

Two chemical feed systems are included for feeding polymer to the main treatment unit and sludge dewatering device. Each chemical feed system shall be complete with one chemical metering pump, electric motor, pump control and associated piping valves and instruments. Chemical feed systems shall be automatically controlled. Metering pumps shall be capable of continuously feeding from chemical supply drums.

e. Electrochemical Cell

The cell shall produce 4.5 pounds of iron to remove 1 pound of heavy metals. About 5 kilowatt hours are required for a pound of heavy metal removed. A typical cell operates at about 25 amps DC. The voltage on the cell is a function of electrical conductivity of the water. The amperage required is a function of the flow rate and the heavy metal concentrations in the wastewater stream.

f. Retention Tank

The retention tank is sized to provide 80 minutes retention based on the maximum design flow rate. One 10,000 gallon capacity retention tank shall be furnished.

g. Flocculation and Clarifier

The clarifier is sized for an effective overflow rate of 0.25 gpm/ft^2. The clarifiers shall be designed for intermittent automatic sludge drawoff. The clarifier influent is uniformly distributed and the effluent trough has an adjustable 90° v-notch weir. The weir overflow rate shall not exceed 10 gpm per linear foot. The clarifier includes a flocculator and a mixer for polymer flocculation. The flocculator provides gentle mixing to keep waste and floc in motion for optimum floc growth. The mixing is maintained at the temporal mean velocity gradient between 20 and 70 sec^{-1}. The flocculator has a minimum detention time of 2 minutes.

The clarifier is equipped with a sludge hopper having a one day storage capacity and a positive displacement progressive cavity sludge pump and electric motor. A sludge withdrawal

timer is included to withdraw the sludge on a programmed basis.

h. Filters

One pressure filter shall be included, designed to operate at a maximum flow rate of 125 gpm. The surface loading rate on the filter shall not exceed 5 gpm per square foot and backwash flow rate will not exceed 15 gpm per square foot. The filter system shall be automatic in operation and shall include two filter feed pumps, one filter backwash pump, one air scour blower, all internals, piping, instruments, controls, and dual media. The filter shall be designed for a pressure of 100 psig. The filter underdrain shall be of the header lateral type with corrosion resistant laterals. Underdrain gravel shall be properly sized to prevent leakage of media into the lateral system and to minimize disturbance during the air scour and backwash cycle. Filter backwash shall be controlled by the predetermined pressure drop through the filter.

i. Carbon Adsorber

Type and quantity - 3 downflow fixed bed columns
Influent quality - TSS <35 ppm
Oils <10 ppm
Design flow rate - 125 gpm
Least adsorbable compound - xylene
Time of breakthrough - 120 days based on 125 gpm
System pressure drop - <30 psi
Hydraulic loading - <5 gpm/sq. ft.
Carbon quality equal to Calgon Filtrasorb 300, ICI America Hydrodata 3000, or Westvaco Nuclear WV-L
Underdrains - header lateral type
Carbon transfer system - closed loop hydraulic system
Spent carbon - disposed of off-site

j. Sludge thickener

Type and quantity - 1 gravity thickener
Solids loading - not to exceed 10 $lb/ft^2/day$
Hydraulic loading - 200 gpd/sq. ft.
Side water depth - 15 ft.
Retention time - 24 hours
effluent structure for thickener overflow consists of a v-notch weir, effluent launder and a common sump.

k. Sludge Dewatering

Chemical conditioning - required
Dewatering equipment - one filter press
Operating time - 8 hour/day, 5 day/week
Cycle time - 200 minutes (2-1/2 hour per cycle)
or 2 cycles per day
Filtration rate - 2 $lb/ft^2/hr$
Cake solids - 25 wt percent (minimum)
Water needed per cycle - 1000 gallons
Air blowdown per cycle - 1000 scf at 30 psig

5.2.4 System Implementation Assessment

Unit processes used in the specified process for water treatment are well established as demonstrated by their performance in many water and wastewater treatment applications. Over 150 electrochemical process installations can be found with applications in heavy metal removal in the U.S. Results are generally excellent and prove that the technology is effective in heavy metal removal. The activated carbon adsorption process is one of the most widely applied technologies for organics removal because of its effectiveness for a wide variety of organic mixtures.

The final treatment system shall be designed to provide for the continuous flow of wastewater through the chemical and physical treatment and through many processing steps. The system will be modular and allow for sizing to 250 gpm flow if necessary. The system's instrumentation and controls monitor flows, pressure or water levels and shall automatically adjusts chemical feed rate and iron production. The systems level switches shall automatically operate the feed and process pumps to allow for the uninterrupted wastewater flow through the system. Interlocks and alarms shall automatically shut down the system if critical components are operating outside of the design limits. The system shall be capable of providing treatment with only minimal operator attention.

The final treatment system shall be engineered to be totally integrated, skid-mounted and automatically controlled for maximizing reliability, transportability and installability. The materials and components needed to construct the proposed treatment system are readily available. There is no long lead procurement item to delay the normal construction sequence and schedule. The sizes and configurations of the equipment shall allow for over the road mobility. Any large piece of equipment can be shipped in several parts which will be assembled on site. The time required for detailed design, equipment selection and erection and shipping to the site is estimated to be about 4 months. The installation and testing of the treatment system and the construction of the Pre-Engineered Building to house the system should be completed in a 3 month period.

The installed treatment system should be very reliable and operable for the life of the Project, estimated to be 10 years, if a normal maintenance program is properly maintained. The normal maintenance program may include pump inspections at regular intervals to detect any wear or deterioration, as well as flow meters and instrument calibration. Thus, the useful life of the treatment system should exceed the 10 year groundwater extraction duration.

During the system operation, the potential for plant operator exposure to the hazardous conditions does exist. The hazardous conditions may include chemical handling, wastewater contacts, and sludge processing. Health risk should be minimal and easily controlled by using standard safety and health procedures. No air emission of known contaminants will be released from the system. The dewatered sludge and spent carbon will be tested for TCLP characteristics. If the sludge or spent carbon is a characteristic waste then the sludge or spent carbon will be disposed of in an approved hazardous waste landfill.

5.2.5 Performance Monitoring and NPDES Requirements

The direct surface water discharge will be sampled initially at a minimum of once per week. More frequent sampling will occur during the first two months of plant start-up. The sample collection point will be at a location in the effluent pump discharge line downstream from the carbon adsorption units but prior to the final polishing unit and the actual surface water discharge. The following parameters will be analyzed, based on a 24 hour composite sample (unless otherwise specified):

- pH;
- Total Organic Carbon (TOC);
- Total Organic Halogen (TOX);
- Oil and Grease;
- Total Suspended Solids (TSS);

- Total Dissolved Solids (TDS);
- Indicator Metals;
- Indicator Organic Chemicals;
- Flow Rate.

The above indicator metals and indicator organic compounds are a number of selected contaminants which can be used to verify the adequacy of treatment compliance with Surface Water Discharge Criteria. These indicators are relatively "difficult to remove". Thus, if these selected indicators are in compliance with the discharge criteria, other contaminants are expected to comply with the discharge criteria. The compounds are selected on the basis of their relatively high concentration and the removability from the groundwater by the treatment processes provided. The compounds are divided into metals and organics as discussed in the following:

Metals - Manganese and Nickel

The removal mechanism for these contaminants are co-precipitation with iron salts prior to organic removal. Manganese and nickel are selected based on the traditional difficulty of removal, particularly to low levels. Removal efficiencies of these two contaminants are largely affected by pH sensitivity, and high solubility products. In addition, their initial concentrations are high in some of the wells sampled by EPA.

Organics - Xylene, Dicofol and Chlorobenzilate

These contaminants have the highest observed values among the mixtures of organics identified. The primary removal mechanism for these contaminants is adsorption with activated carbon. Compound adsorbability by activated carbon is favored by many factors including increasing carbon chain length, increasing aromaticity, decreasing polarity, decreasing branching, decreasing solubility, decreasing degree of dissociation, and other characteristics. Xylene and dicofol have relatively high solubility, low aromaticity and less weight compared to other compounds found on site. Based on organic carbon/water partitioning data, these contaminants will be the first to break through the granular carbon adsorption unit and are selected as good performance indicators.

In addition, the following indicators have been requested by EPA:

- Chromium;
- Lead;
- Cadmium;
- Selenium;
- EPA method 601 analytes (volatiles).

When the complete groundwater extraction and treatment system has been installed and operated for several months, an effluent testing program consisting of bioassay can replace the comprehensive testing that is needed during soil cleanup operations. The decision of when to incorporate bioassay testing of WTS effluent will be made by the EPA based on actual performance data collected during initial operation by EPA's Construction Manager.

5.2.6 WTS Operation Transfer

Approximately two months prior to contract close out of the WTS subcontract, the WTS Contractor will provide for transfer of operation of the system to another Contractor. Training, manuals, hands-on demonstration, experiences with the system and other in-person information transfer will be provided.

It is expected that key operations including but not limited to carbon replacement, filter backwash, dewatered cake disposal, system adjustment and system maintenance will be provided. The purpose of the custody transfer training is to provide smooth transition of operation responsibility from the WTS Contractor to EPA and the EPA Contractor.

5.3 GROUNDWATER EXTRACTION SYSTEM

The approach to cleaning up the contaminated Surficial Aquifer at the Tower Chemical Site consists of using fourteen extraction wells near the leading edge of the plume in the burn/burial area, and using four high flushing rate wells in the sinkhole. Well locations and construction requirements are shown in detail in the design drawings and described in the specifications.

Well locations and pump rates were determined using a groundwater flow simulator. A detailed discussion of the modeling is provided in the Basis of Design for Groundwater Extraction, Appendix A, and key features of the conceptual extraction system are discussed below.

5.3.1 Plume Cleanup

The contaminated groundwater plume is approximately eight acres in area extending toward the unnamed stream (see Drawing BOD-1 in Appendix). Fourteen extraction wells (R9 through R22) located as shown in Drawing BOD-3 provide a capture zone that encompasses the entire leading edge of the plume.

The interception approach was selected to allow high rate flushing as well as long term collection of leaching contaminants. Also, the wells are strategically located in order to capture groundwater in the areas near MWS-10 and the southwest quadrant of the site. The contour map of the Surficial Aquifer under the influence of the extraction system (Drawing BOD-3) indicates that these areas of less well defined contaminant plume definition are within the capture zone of the extraction system. In order to accelerate plume recovery and to prevent excessive dewatering of the aquifer, four reinjection well pairs (I1 through I8) are located near the plume center.

5.3.2 Sinkhole Cleanup

The relict sinkhole located in the backfilled waste lagoon area of the site (See Drawing BOD-1) presents cleanup issues that are different from the Surficial Aquifer plume. A pump test conducted by EPA in 1988 indicates that the sinkhole has higher hydraulic conductivities than the Surficial Aquifer, and is probably hydraulically connected to the underlying Floridan Aquifer. Boring samples collected by EPA in 1988 also show that sediments to a depth of at least 12 feet are highly contaminated with dicofol, and the contamination could potentially go deeper than 18 feet. Excavation of these materials is technically difficult because of the expected dewatering rates, and both costly and logistically complicated due to strict Surface Water Discharge Criteria.

Technical feasibility of drawing recharge from the Floridan Aquifer to clean the soils was evaluated using a laboratory study of site sediments (see Section 3.4). The results of the calculation indicated that soil flushing is technically feasible and much less expensive overall than excavation and thermal treatment. Therefore, eight extraction wells (R1-R8) are located in the most highly contaminated zones and will be pumped at 15 gpm each. Because of the effect of overlapping cones of depression and drawdown, wells will be pumped in an alternating pattern. Wells R1-R4 will be pumped for one month, then shut off while wells R5-R8 are pumped. The cone of depression zone at each of the extraction wells will therefore also be flushed.

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5.3.3 Installation Requirements and Considerations

Performance specifications for components of the extraction system are detailed in the design specifications. However, the general requirements are summarized in the following:

Well Installation

- o The recovery wells shall be constructed of 6 inch Schedule 40 stainless steel casing and 0.020-inch wire-wrapped (continuous slot) stainless steel screen.
- o The drillhole shall be advanced by direct rotary drilling techniques. Only a 100% bentonite mud drilling fluid will be used.
- o Initially a 4 3/4-inch pilothole shall be completed to depth. Continuous samples will be taken to determine suitability of the location, the exact screen placement and screen slot sizing and packing requirements. Following the logging, the pilot hole will be reamed to a 15-inch diameter.
- o The casing and screen shall be placed in the drill hole with centralizers spaced every 10 feet.
- o Following placement of the casing and screen a filter pack consisting of washed, graded sands and gravels, as specified by the rig geologist, shall be placed in the annular space by tremie line. Care will be required to insure uniform filter pack placement. The pack will be placed to approximately two feet above the screen.
- o The placement of the filter pack shall be followed by the placement of a two-foot bentonite seal then cement in the annular space to properly seal the well from the surface. The cement shall be a neat, Class C (API) cement consisting of 5.0 gallons of water per

sack of Portland Cement. The cement mix will be placed by the use of a tremie line. Cement will be added until ground surface level is reached. A minimum eight hours of hydration of the bentonite seal shall be allowed prior to installation of grout.

- o A work pad (4-ft X 7.5-ft X 6-in) shall be constructed at the well head, of reinforced concrete. A surveyors monument shall be placed in the pad identifying the well and presenting horizontal and vertical coordinates. A steel protective casing will be placed over the well casing.
- o Once installed, the well will be developed through the use of surging, bailing and overpumping techniques. Development will continue until the sand content of the well discharge is less than 0.01 ml (Imhoff cone method).
- o Well development water will be stored on-site in the water treatment Flow Equalization Tanks and treated to required discharge criteria before disposal.

The purpose of these requirements is to achieve high water extraction efficiencies in the wells, and to install wells that are serviceable for the life of the Project. Problems with incorrectly sized screen slots, gravel pack, installation and development will be avoided by following these requirements.

Pumping System

Groundwater shall be extracted by twenty two submersible well pumps (14 groundwater extraction well, and eight sinkhole wells of which 4 operate at any one time). Each of these pumps is sized to accommodate the raw water flow determined by the flow simulation. All of the pumps shall have a discharge pressure gauge, a high and low level switch, a sample point, a combination pressure sustaining/check valve, and combination vacuum breaker/air release valve.

The discharge from all twenty two pumps is routed to either one of two raw water Flow Equalization Tanks. These tanks are sized to accommodate the expected raw water flow for an entire day and still have reserve capacity. In addition, the tank size is an industry standard for field erected tanks. Each tank shall have three level switches and a level gauge.

From the Flow Equalization Tanks, raw water shall be transported to the treatment area by the raw water pump. The pump is sized to transport the total raw extracted water flow, plus additional capacity has been added for abnormal operating conditions. A pressure gauge is located at the discharge of each pump, and each pump has a minimum flow recirculation back to the Flow Equalization Tanks. This recirculation line prevents the pumps from operating below their rated minimum flow capacity if flow to the treatment area is stopped while a raw water pump is operating.

The low level switch installed in each well will shut the pump off in that well if the water level drops below the switch. When the water level in the well rises to the high level switch, the pump will restart. A timer will also be installed to prevent the pumps from recycling too quickly. This will prolong pump motor life if the water level rises and falls rapidly.

The Flow Equalization Tanks receiving raw water from the wells will also supply the operating raw water pump. If the water level in the storage tank reaches the tank high level switch, a switch will trigger and the raw water will be automatically diverted to the other tank. If the water is not diverted and the tank level continues to rise, the water will eventually reach the high-high level switch. When this happens, all well pumps will be stopped. The pumps will then restart individually when the tank level has dropped below the high level switch.

Performance Monitoring Program

A performance monitoring program will be initiated by the Contracting Officer to monitor the performance of the groundwater recovery system. The monitoring program will monitor such parameters as water levels and groundwater containment concentrations in the Surficial Aquifer. Existing monitor wells at the site will be used to monitor the progress of the plume cleanup. Quarterly groundwater samples will be collected from each of these wells and combined with water treatment system influent sample data. These data will be used to chart the progress of the plume cleanup and to adjust the pump rates if excessive dewatering occurs.

5.4 Site ARRANGEMENT/DEVELOPMENT

The proposed site Arrangement is shown in the design drawings. site access will be via the existing road from State Route 455. On-site access roads will be light-duty gravel on a compacted subgrade. The road has been arranged to provide light vehicle access to the well heads and to the Water Treatment and Thermal Treatment System areas.

access

The existing Vita-green building cannot be utilized for stockpiling or other remedial operations unless repairs are made to the structure. It will be at the discretion of the TTS Contractor whether or not to use the building and perform the necessary repairs. The area to the southwest of the building will be developed as the Thermal Treatment System

Area, with the ash stockpile adjacent to it. The Water Treatment System enclosure and the water storage area is located in an uncontaminated area on the northeast corner of the property. The Contractor will be responsible for the design of the enclosure, a pre-engineered metal building, and for the design of the Flow Equalization Tanks. Building services will include lighting and ventilation, with air conditioning provided for the office area only.

New security fencing will be installed around the perimeter of the site. New perimeter gates will be installed at the main entrance road and north of the Water Treatment System building. The Thermal Treatment and the Water Treatment Contractors will have separate site entrances and separate facilities. The division is intended to eliminate work delays due to interference of one Contractor with another.

Clearing, grubbing, and grading will be required for excavations, road and fence construction, water treatment system building and flow equalization tank construction, thermal treatment system equipment and pond installation, and for above ground pipe routing.

Above ground piping will be supported directly on the prepared ground surface. Where piping must cross the road, pipe will be routed underground and enclosed in a pipe sleeve. Preliminary pipe routing is shown in Drawing 4236.734-006-C, along with the recovery and injection wells. Each well will be provided with a service receptacle and lighting.

Excavation of contaminated soils and backfilling will be completed prior to well, piping, and road construction in contaminated areas, as shown in the drawings and schedule.

5.5 ELECTRICAL/INSTRUMENTATION AND CONTROL SYSTEMS

Based on a review of existing transportable incineration systems available for this job, it is estimated that at least 250 KW of 480V 30 amperes power will be required for the incineration and air pollution control system. Additional 220 and 110 volt power will be required for trailers, controls, lighting and other auxiliary components.

The local power company will supply distribution power at 480 volts, 600 to 800 amperes, 14 KAIC and all metering at the jobsite. If the power company cannot supply 480 volt power the Contractor will be responsible for installing step down transformer to reduce the power company distribution voltage to 480 volts.

The Contractors will also be responsible for distributing and control of the power to the extraction pumps, waste water treatment plant package, retention pond pumps, area lighting, and all other equipment as required.

Each extraction pump motor will have a local control station with a built-in starter, indicating lights, control power transformer (480V to 120V), lockable selector switch, overload relays, 120 volt start coil, etc. Each pump will have an "Auto" and "Hand" mode of operation. In the "Auto" mode, well levels will cycle the pumps and in the "Hand" mode, the pumps will operate regardless of the well levels.

The Water Treatment System will be a complete unit with all controls, starters, transformers, instruments, lights, motors, control panels, HVAC, etc. Only one main power feed will be supplied in, and one normally open system shut down contact will be brought out, to shut down the extraction pumps. Lights will be located at each pump head and each door to the water treatment building. In addition, one 120 volt receptacle will be located at each extraction pump motor starter.

5.6 Work Sequence

Remedial operations have been grouped into two separate phases for each Subcontract. These phases allow an orderly progress of work with minimal Contractor interferences. Each phase and the rational for sequencing is discussed in this section.

Phase One - Water Treatment

Because of the need for Water Treatment to perform all other work phases, installation and start-up of the entire Water Treatment System will be the major schedule component during this phase. Initially, the perimeter fence will be installed to provide basic site security. Once the fence is installed, construction of the Water Treatment System, building and Flow Equalization Tanks will commence. It is essential that the WTS become operational as soon as possible so that subsequent remedial operations avoid excessive wastewater storage.

Phase One WTS also includes installation of all roads, piping, wells, pumps and other hardware in the Phase One area shown in the drawings. This work will require clearing and grubbing for the fence, construction of a building, grading, office trailers, power and utilities, all necessary permits and shop drawings. The treatment system, including operators, chemicals, power and other necessary services, will be operated during subsequent work phases in order to provide continuous waste water treatment capability in support of other site remediation operations.

Phase One - Soil Remediation

The first phase of Soil Remediation will commence upon start up and operation of the WTS. Phase One Soil Remediation consists of site preparation and grading, construction of the retention pond with pump and associated hardware, Trial Burn, and excavation, treatment and backfilling contaminated soil closest to the vita-green building. These operations may take 12 months or more after the TTS Contractor mobilizes to the site.

Use of the available TTS work area as shown in the drawings will be based on the requirements of the TTS Contractor. If the TTS Contractor requires the use of the Vita-Green building, for stockpiling or any other use during this phase of work, then he will be required to submit a plan for repairing the structure or otherwise rendering it safe for use. If the TTS Contractor wishes to relocate the retention pond to avoid excavating contaminated soil and can still retain sufficient work area for TTS operations (stockpiling of soil, fly ash, bottom ash, etc.), he must provide with his bid package a specific description including drawings, of how he will proceed with Phase One.

Phase Two - Soil Remediation

The second phase of Soil Remediation includes excavation of all contaminated soil, treatment, backfilling, retention pond closure, TTS area cleanup, and demobilization from the site. This phase is expected to take approximately four months.

Phase Two - Water Treatment System

When all areas of contaminated soil have been remediated and backfilled, this phase will complete installation of the groundwater extraction system. It is possible that as much as 16 months may separate Phase One and Phase Two of WTS installation. Included in Phase Two is preparation of an operator's manual, maintenance schedule, and up to two months operator training as necessary to transfer responsibility for operation of the Water Treatment System to another Operator. This transfer will occur 12 months after completed installation and operation of the Water Treatment System.

6.0 PERMITS AND REGULATORY REQUIREMENTS

In accordance with 40 CFR 300.68(a)(3), a Federal Resource Conservation and Recovery Act (RCRA) Permit is not required for a Superfund-Financed Remedial Action taken pursuant to Section 106 of the Superfund Amendment and Reauthorization Act (SARA) of 1986. However, SARA does contain provisions which require remedial actions to meet all legally applicable or relevant and appropriate standards. Florida RCRA requirements parallel those at the Federal level regarding regulations of hazardous waste treatment units constructed for Superfund-Financed Remedial Actions. It is important to note that the schedule requires that both Contractors show evidence of permit applications (copies of completed application forms and letters) as necessary at the pre-work meeting.

6.1 Groundwater Recovery

It is anticipated that Well Construction Permits will be required for installation of shallow aquifer injection or extraction wells. State regulations governing the construction of injection wells are provided in F.A.C. Chapters 17-3, 17-4 and 17-28. It is the responsibility of the Contractor to determine permit requirements and obtain any necessary permits for groundwater extraction or injection.

6.2 Water Treatment

A NPDES permit is not required for the surface water discharge of the treated effluent from the Water Treatment System. However, the Contractor shall still need to adhere to EPA/State determined discharge criteria and comply with all the laws, ordinances, codes, rules and regulations of the Local, State and Federal Authorities having jurisdiction over any of the work related to the design, erection, installation and operation of the Water Treatment System.

The major Federal Law and Regulations affecting water discharge and solid waste disposal are listed as follows:

RCRA Regulations	40 CFR 260-265
POTW Pretreatment	40 CFR 403 Standards
Safe Drinking Water Standards (SDWS)	40 CFR 141
Clean Water Act (CWA)	40 CFR, Parts 122-125
Water Discharge	FAC, Rules 17-3 and 17-7
Water Quality Standards (WQS)	FAC Rules 17-3.404, .405., or 406
Solid Waste Disposal	FAC Chapters 17-3 and 17-7

The Groundwater Protection Strategy (USEPA, 1984) and its associated guidelines for groundwater classification under the EPA Groundwater Protection Strategy (USEPA, 1986b).

The Groundwater Protection Strategy (USEPA, 1984) and its associated guidelines for groundwater classification under the EPA Groundwater Protection Strategy (USEPA, 1986b).

6.3 Thermal Treatment

The Thermal Treatment System will not require a RCRA permit. However, all applicable, relevant and appropriate Requirements (ARAR's) under both State and Federal Regulations must be met. It will be the Contractor's responsibility to meet all ARAR's for TTS operation at this site and indicate during the proposal/bid period how these ARAR's will be met. A partial list of requirements is provided in the following:

<u>Performance</u>	The Thermal Treatment System must be designed and operated in accordance with the performance standard of 40 CFR 264 Subpart O.
<u>Trial Burn</u>	The Thermal Treatment System must be tested in accordance with the Trail Burn Procedures in 40 CFR 270.62.
<u>Air Emissions</u>	The Ambient Air Quality Standards of 40 CFR 50 and Florida Ambient Air Quality Standards in FAC 17-2.300 must be complied with at the site boundaries.
<u>Stack Height</u>	The stack height must be in accordance with Florida Air Pollution Control rule FAC 17-2.270.
<u>Employee</u>	Employees must be trained as specified in <u>Training</u> 29 CFR 1910.120. Training and documentation must also be as specified in 40 CFR 270.14 and 40 CFR 264.16.

6.4 site Work Permits

The Contractor will be responsible for determining which State and Local Permits are required for specific construction activities. It is anticipated that a local building permit will be required for construction of the Water Treatment Facility.

6.5 Hazardous Wastes Transported Off-site For Disposal

Any wastes transported off-site for disposal must be manifested in accordance with 40 CFR 262. The Transporter used must comply with 40 CFR 263 and be licensed in all states between Florida and the waste destination. The facility accepting the wastes must have a RCRA Part B Permit submitted in accordance with 40 CFR 270 and be in compliance with the Interim Status Performance Standards of 40 CFR 265.

It is anticipated that no hazardous waste will be transported off-site unless it is taken to a facility where it will be incincerated or stabalized. In all cases, hazardous waste handled, treated and disposed by the Contractors must not violate the Federal Land-ban regulations.

7.0 CONTRACTUAL APPROACH TO REMEDIAL ACTION

One contract, referred to as the Thermal Treatment System (TTS) Contract, will include site preparation, retention pond construction and operation, excavation, dewatering, backfilling, soil thermal treatment, testing and cleanup verification.

The second contract, referred to as the Water Treatment System (WTS) Contract, will include installation of the groundwater recovery system, installation and one year operation of the Water Treatment System and associated site development. Long term operation of the WTS is beyond the scope of this Contract and will be provided by EPA and/or FDER.

The areas of performance of these two Contracts have been segregated to aid in contract management and to avoid Contractor interfacing. Without this segregation the likelihood of construction "Out Of Scope" claims will be excessively high. The only points of interface will be in the area of potentially contaminated runoff collection and excavation dewatering. Potentially contaminated runoff from the TTS work area will be collected in a retention pond and treated by the WTS Contractor. Potentially contaminated excavation water will be suitably clarified and treated in the WTS.

Other RA activities will be performed by others, under contract to EPA. These other activities will include the following:

- o Cleanup performance of Extraction System;
- o Water quality monitoring;
- o Air quality monitoring at the site perimeter;
- o Existing well removal;
- o Stabilize incinerated soils (as required).

The two Contracts required to implement the RD will be prepared to utilize the "one-step negotiated" procurement procedure as described in FAR Part 15 - Contracting by Negotiation. The primary advantage of this procedure is that the best combination of technical approach and lower cost can be obtained.

The WTS contract bid process will be conducted in two phases. The first phase will include a site visit by prospective bidders, and a limited quantity of groundwater will be made available (shipped to the bidder's laboratory) for treatability testing or other purposes to allow the bidders to refine their bids and provide reasonable performance warranty. Those bidders evaluated to be technically acceptable will be requested to submit cost proposals based on the technical proposal. A technical presentation by the bidders will also be requested during the second phase of contract procurement.

8.0 DESIGN DRAWINGS AND SPECIFICATIONS

The List of Drawings shown in Table 8.1 were prepared in order to clarify and describe the Work for which the WTS Contractor is responsible. Table 8.2 is the List of Drawings prepared to clarify and describe the Work for which the TTS Contractor is responsible.

Specifications are prepared in Construction Specifications Institute (CSI) format and are two volumes; Statement of Work *(Technical Specifications) Remedial Design for Soil Thermal* Treatment System, Volume II and respectively Statement of Work (Technical Specification) Remedial Design for Water Treatment System, Volume II. These specifications are bound separately from other subcontract volumes which contain bid requirements, Schedule of Prices, Bidder Questionnaire, and other contractual documents. The first section of each specification set contains a Summary of Work which itemizes the work tasks. A list of specification titles is provided in Table 8.3, Soil Thermal Treatment Specifications and Table 8.4, Water Treatment System Specifications.

TABLE 8.1

LIST OF DRAWINGS IN WATER TREATMENT SYSTEM CONTRACT

TOWER CHEMICAL REMEDIAL DESIGN

-----	Cover Sheet
4236.734-001-C	Site Location Map and Index of Drawings
4236.734-002-C	Existing Site Conditions
4236.734-003-C	Site Grading, Drainage, Roads and New Fencing
4236.734-004-C	Coordinate Layout Plan
4236.734-005-C	Construction Phases
4236.734-006-C	Site Arrangement
4236.734-007-C	Miscellaneous Details
4236.734-008-C	Miscellaneous Details
4236.734-009-C	General Notes
4236.734-001-E	One Line Diagram and Panel Schedules
4236.734-002-E	Control Wiring Diagram
4236.734-003-E	Elec. Plan, Sections and Details
4236.734-004-E	Elec. Plan, Sections and Details
4236.734-005-E	Control Wiring Diagram
4236.734-001-M	Raw Water Flow Diagram
4236.734-002-M	Well Details
4236.734-001-P	Process and Instrumentation Diagram

TABLE 8.2

LIST OF DRAWINGS IN THERMAL TREATMENT SYSTEM CONTRACT

TOWER CHEMICAL REMEDIAL DESIGN

-----	Cover Sheet
4236.734-011-C	Site Location Map and Index of Drawings
4236.734-012-C	Existing Site Conditions
4236.734-013-C	Coordinate Layout Plan
4236.734-014-C	Construction Phases
4236.734-015-C	Contaminated Soil Excavation Plan
4236.734-016-C	Clean Soil Excavation and Backfill Plan
4236.734-017-C	Site Arrangement
4236.734-018-C	Miscellaneous Details
4236.734-019-C	General Notes
4236.734-001-E	One Line Diagram and Panel Schedules
4236.734-002-E	Control Wiring Diagram
4236.734-003-E	Elec. Plan, Sections and Details
4236.734-004-E	Elec. Plan, Sections and Details
4236.734-005-E	Control Wiring Diagram
4236.734-001-M	Raw Water Flow Diagram
4236.734-002-M	Well Details
4236.734-001-P	Process and Instrumentation Diagram

Table 8.3
SOIL THERMAL TREATMENT SPECIFICATIONS
TOWER CHEMICAL REMEDIAL DESIGN

Specification Title	Specification Number
Summary of Work	01010
Measurement and Payment and Schedule of Values	01025
Special Project Procedures	01030
Field Engineering	01050
Safety, Health and Emergency Response	01065
Project Meetings	01200
Submittals	01300
Site Specific Quality Management Plan	01400
Construction Quality Control	01410
Chemical Quality Control	01430
Chemical Testing Laboratory Services	01440
Spill Control	01450
Mobilization/Demobilization	01505
Site Utilities	01510
Security	01540
Temporary Controls	01560
Project Record Documents	01720
Project Close Out	01735
Off-site Transportation and Disposal	02090
Site Preparation	02100
Retention Pond Management	02140
Materials Handling	02200
Treatment Verification	02210
Cleanup Verification of Contaminants	02212
Backfill and Grading	02222
Excavation and Handling of Contaminated Material	02410
Dewatering	02450
High Density Polyethylene Liner	02590
Landscaping	02900
Concrete	03001
Concrete Slabs	03300
Thermal Treatment System Performance Specifications	11900
Trial Burn for the Thermal Treatment System	11905

Table 8.4
WATER TREATMENT SYSTEM SPECIFICATIONS
TOWER CHEMICAL REMEDIAL DESIGN

Specification Title	Specification Number
Summary of Work	01010
Measurement and Payment and Schedule of Values	01025
Field Engineering	01050
Safety, Health and Emergency Response	01065
Project Meetings	01200
Submittals	01300
Product Data, Working Drawings and Samples	01340
Site Specific Quality Management Plan	01400
Construction Quality Control	01410
Chemical Quality Control	01430
Chemical Testing Laboratory Services	01440
Spill Control	01450
Mobilization/Demobilization	01505
Site Utilities	01510
Security	01540
Temporary Controls	01560
Project Record Documents	01720
As-Built Drawings	01725
Project Closeout	01735
Off-site Transportation and Disposal	02090
Site Preparation	02100
Earthwork	02210
Crushed Stone Access Roads	02500
High Density Polyethylene Liner	02590
Wells	02715
Fences and Gates	02830
Culverts	02722
Landscaping	02900
Concrete	03001
Concrete Floors	03300
Water Treatment System	11800
Auxiliary Equipment	11805
Pre-Engineered Metal Building	13121
Basic Mechanical Requirements	15010
Piping, Valves and Appurtenances	15050
Electrical System	16000
Conduit	16111
Wire and Cable	16120
Electrical Identification	16195

9.0 REMEDIAL ACTION SCHEDULE

The Contractors will be required to meet minimum schedule requirements according to the milestones presented in Table 9.1: Remedial Action Schedule-WTS Tower Chemical Remedial Design, and Table 9.2: Remedial Action Schedule-TTS Tower Chemical Remedial Design. It is anticipated that Contractors will bid the most cost-competitive schedule allowed by the required coordination between Contractors. An accelerated schedule is desirable if it results in early contract completion and reduced cost.

Table 9.1

REMEDIAL ACTION SCHEDULE - WTS

TOWER CHEMICAL REMEDIAL DESIGN

Event/Activity Completion	Week After Notice to Proceed
Construction Permits Application	1
Fabrication Drawings Submitted	5
Fencing and Temporary Controls	10
Erect Building and Tanks	25
WTS Operational	34
WTS Operation Transfer	156 3yr.